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THE LIFETIME EARNINGS OF ENGINEERS AND SCIENTISTS

by John C. Evvard

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Cleveland, Ohio

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INTRODUCTION

Engineers and scientists as a group are keenly analytical in their profession. Their income, however, is earned and spent on a week to week basis. Most professionals have therefore not evaluated the financial rewards from their abilities during a lifetime career nor do they have a clear understanding of the value of excellence to their personal standard of living. Likewise, although retirement plans are often discussed, seldom is there a clear evaluation of a retirement plan return relative to a private investment program. A brief study was therefore initiated during the spring of 1969 to answer some of these questions.

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The numerical results obtained are based upon income versus experience curves that must inherently be only transiently correct. Nevertheless, important insights have been obtained that are more general than the data from which they have been derived.

Initially, the salary versus experience (SVE) curves were assumed to be never altered. The effects of quality and the worth of retirement plans were evaluated under this erroneous assumption. Portions of the calculations were repeated under the assumption that the salaries shown on the SVE curves increase by 4% per year. Important added insights are thus obtained.

The first step in a study of this kind is to establish SVE curves. Because the NASA-Lewis Research Center is engaged principally in research and development activities, the EJC data from page 36 of Reference 1 was used for this purpose. These curves were then arbitrarily increased by 14% so as to be hopefully comparable to the July 1969 statistics, (the date of a pay raise for government employees).

The results are shown on Figure 1 where annual gross salary is presented versus years since the B.S. degree. The plotted salary is earned or exceeded by the listed percent of the population. For example, 25% of the population earns the plotted 25 percentile salary curve or more. Figure 2 from page 60 of Reference 2 and the data of Reference 3 suggest that the extrapolation technique may not have been valid although somewhat different statistical samples are involved. However, References 2 and 3 were not available when this study was conducted so Figure 1 was used.

Guidelines for promotion were then determined taking into account the July 1969 GS grade and step schedules to achieve an approximate match to the curves of Figure 1 but without the dips. The salaries versus experience and quality so obtained were the ones actually used in the study that is described hereinafter. Because the guidelines are privileged information, somewhat arbitrary, and out of date, the actual detailed assumed SVE data are not presented. Suffice it to say that Figure 1 is a fair approximation subject to the rules that the 90% and 10% men asymptote at GS-11 and GS-16 grades respectively. The assumed values for the 10% man's income are partially included in Table VIa.

Because the primary concern is take home pay, a new set of assumptions must be introduced in order to continue. As shown on Table I, our hero begins his career at age 22. He works for three years as a bachelor, is married three years without children, then has three children three years apart. He retires at age 62 and he and his wife get double exemption at age 65. The 1968-1969 tax table was used and a 10% surtax was included. During his 40 years of service, the 6-1/2% government retirement deduction and the federal income tax were subtracted from the gross pay to yield his take-home rewards. No state and local taxes were considered. After 40 years of service, he retires under the government retirement plan and accepts a slightly reduced annuity for the wife survivorship benefits. For two or three years in retirement (until his retirement deduction input is exceeded) he pays no income tax. (He has already paid it!) Thereafter, the tax tables again apply.

Figure 3 presents the accumulated take-home earnings of the 10%, 50%, and 90% individual. Because each reader will personalize his interpretation of this graph, no date of death is shown. Several interesting conclusions can be drawn from this graph.

The take-home pay of the poor performers is a surprisingly high percentage of the outstanding individual. Table II compares the 50% and 90% man's integrated gross and net salary to that of the 10% man. With 40 years of service, the 50% and 90% guys have respectively 3/4 and 5/8 of the outstanding individual's take-home pay. This ratio declines somewhat through the retirement years because of a more advantageous retirement return for the 10% individual.

As illustrated on Figure 4, part of the standard of living compression is due to the non-linearity of the federal income tax. From Table III, the 10% man might return 20% of his gross lifetime earnings to the government as tax. The 90% individual on the other hand pays only 15%. Both presumably receive the same benefits in return.

From Figure 3, the government retirement plan provides a substantial portion of the net life income. Table 4 shows that this can amount to more than 50% of the net income earned while working if one has a good life expectancy. This conclusion is based upon the erroneous assumption that the SVE curves do not change with time. The actual retirement return is greater than that shown in Table IV.

Figure 5, presents the retirement return ratio, suggesting that the retirement deduction is a good investment with a reasonable life expectancy. As before, the actual return ratio is higher than the values shown because of the enhancement of the SVE curves with time. (See later discussion)

The question might be raised as to how the federal retirement system benefits compare with a private investment plan using the same 6-1/2 percent deduction. Additional assumptions are required to obtain estimates. Tax-free bonds are currently available paying almost 6% interest. The re-invested return for five mutual funds studied over a 15-year period averaged a gain of slightly more than 10% per year. The following assumption was therefore made. Our 10 percentile hero invests 6-1/2% of his salary in the stock market. No income results during the deduction period each year but thereafter his investments yield a 10% gain each year compounded annually. This 10% consists of 4% dividend income and 6% capital gain. Because no stocks are sold, no capital gain tax is required. However,

an income tax must be paid on the reinvested 4% and hence the tax increment (amount over normal tax on salary) was subtracted from the investment fund.

The resulting capital growth is presented on Figure 6. In spite of the the subtraction of government retirement plan take-home pay (retirement minus income tax) the fund continues to grow at a healthy rate.

From this example, one might too hastily conclude that a private investment plan is superior to the government retirement. This would be true if there were no change in the base salary levels over the career and retirement time span. This assumption is incorrect even without inflation. Through automation and technology, living standards and salaries are rising. Figure 7 might serve to estimate how fast the government base salary is changing. The gross salary of a GS-18 position has increased more than 4% per year on the average since 1950 (Figure 7). Using a 4% per year change in the base salary, the career remuneration going backward in time is much less than that employed for Figure 6. The amount of investment capital subject to long term compounding is correspondingly decreased. The computation of Figure 6 was therefore repeated with the base salaries adjusted to reflect a 4% change each year.

Clearly, the resulting accumulation of investment capital is much smaller (Figure 8). In this case, retirement income must in part deplete the capital. The results, however, are sensitive to the assumptions as can be seen from the 42 year retirement extension, where capital is maintained. The conclusion is valid, however, that the government retirement plan is valuable. Because of the "high three" provision, and the statistical change in the salary rate (Figure 7) the government retirement plan compares favorably with private investment with a 10% yield but without the associated risks of the private investment program.

The rather marked differences between the results on Figures 6 and 8 shows the profound effect of the upward shift of the SVE curves with time. Portions of the calculations were therefore repeated for the 10% man under three conditions. The data labeled "present" (Table V) corresponds to unchanging SVE curves throughout the engineer's career. The gross and

net annual salary-versus-experience numbers for this case are the center two columns of Table V or the detailed data on Table VIb.

These salaries are decreased by 4% per year (compounded) to obtain the data labeled "past." (Tables V and VIa.) This might represent the lifetime salary pattern of an outstanding man who has worked for 40 years and is just about to retire.

Assuming that the upward shift in the SVE curves will continue, the salaries listed under "present" were increased by 4% each year to obtain the columns marked "future." (Tables V and VIc). These columns represent the extrapolated expectations of an outstanding citizen who has just received his B.S. degree and has a forty year career ahead of him. Note that he will be making $150,304 per year as compared to the "present" $32,559 after 40 years. The net salary, however, is only $67,288, suggesting the increased benefits that we might expect from government services.

Table VII presents the net-income and federal income tax estimates for the years since B.S. degree. The bright engineer just graduating might earn almost 2.70 million dollars take-home pay if he lives 20 years in retirement. Correspondingly, he has paid 1.76 million out in federal income taxes.

This comparison of total future lifetime rewards for our bright young engineer is further expanded in Table VIII. Perhaps the most interesting new insight comes from the % of gross salary that is paid out in tax. Our previous evaluation of "present" for 60 years showed that roughly 20% of gross salary was paid out in tax. The corresponding contribution of our future engineer is about 38%. The striking difference results from the nonlinear aspects of the tax tables. I believe that the trend shown toward higher tax deductions is real. People are expecting more and more service from their government and this trend will continue. Items of increasing costs with an expanding population might include (1) population control, (2) more sophisticated armament, (3) increasing requirements for high speed mass transportation systems, (4) environmental pollution control and ecological problems, (5) crime control, (6) socialized medicine and health-education and welfare problems, (7) elimination of slum areas, etc.

We can now more realistically evaluate the net retirement income as a percentage of the net working income. The values of Table IX are obtained

for "past," "present," and "future" from the data of Table VI. The retirement return ratio is the net retirement accumulated income divided by the accumulative 6-1/2% retirement deduction through 40 years of service.

Probably either "past" or "future" gives a better indication of the value of the retirement plan than does "present" discussed earlier. It is somewhat startling to see that a retiree for 20 years has received 82% to 85% of his working take-home pay in retirement. This calculation clearly points out the special advantages of the "highest three year salary average" in the government Retirement Act.

The government Retirement Act also includes a cost of living adjustment to protect the retiree against inflation. His standard of living as of his retirement date is thus guaranteed. He does not, however, reap the rewards of the non-inflationary general rise in the standard of living of the nation.

REFERENCES

1. Engineering Manpower Commission: Professional Income of Engineers 1966-1967. Engineers Joint Council, 1967.

2. Engineering Manpower Commission: Professional Income of Engineers 1968-1969. Engineers Joint Council, 1969.

3. Anon.: 1969 National Survey of Compensation Scientists and Engineers in Research and Development. Battelle Memorial Inst. to the U.S. Atomic Energy Commission, Nov. 15, 1969.

TABLE I. - ASSUMPTIONS

[1969 Tax table, 10% surtax, 6-1/2% retirement deduction.]

Age	Service	Dependents	Situation
22	0	1	Working-single
25	3	2	Married
28	6	3	1st child
31	9	4	2nd child
34	12	5	3rd child
49	27	4	1st child of age
52	30	3	2nd child of age
55	33	2	3rd child of age
62	40	2	Retires
65		4	Double exemption

TABLE II. - TOTAL EARNINGS - % OF 10% MAN'S

Basis	Years / Quality	40	50	60	70
Gross[a]	50%	0.714	0.698	0.688	0.681
Gross[a]	90%	.586	.586	.558	.550
Net	50%	0.749	0.728	0.718	0.711
Net	90%	.628	.605	.593	.585

[a]Retirement deduction subtracted.

TABLE III. - INCOME TAX - %

GROSS EARNINGS

Years / Quality	40	50	60	70
10%	22.0	20.3	19.9	19.8
50%	18.2	16.8	16.5	16.2
90%	16.6	15.2	14.9	14.6

TABLE IV. - RETIREMENT RETURN - %

WORKING NET

Years / Quality	40	50	60	70
10%	0	26.8	52.0	77.1
50%	0	23.6	45.9	68.2
90%	0	22.5	43.9	65.3

TABLE V. - 10 PERCENTILE SALARY - R & D

VARIABLE SALARY BASE

Years	Past		Present		Future	
	Gross	Net	Gross	Net	Gross	Net
0	2152	1793	9934	7390	9934	7390
10	5904	5040	19149	14638	27255	19915
20	12573	10161	27549	20309	58042	35922
30	20865	15806	30889	22101	96332	50653
40	32559	22588	32559	22588	150304	67288
Retire	22614	18426	22614	18426	99500	58264

TABLE VI. - LIFETIME EARNINGS FOR 10% MAN

(a) Past - salary base decreases 4% each earlier year

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
1	2,152	1,793.34	218.78	1,793.34	218.78	139.88
2	2,520	2,077.28	278.92	3,870.63	497.69	303.68
3	2,982	2,429.66	358.51	6,300.28	856.21	497.51
4	3,336	2,832.76	286.39	9,133.05	1,142.60	714.35
5	3,776	3,176.64	353.92	12,309.69	1,496.52	959.79
6	4,024	3,369.24	393.20	15,678.93	1,889.72	1,221.35
7	4,406	3,771.50	348.11	19,450.27	2,237.83	1,507.74
8	4,733	4,025.45	399.91	23,475.87	2,637.74	1,815.38
9	5,494	4,614.85	522.04	28,090.72	3,159.78	2,172.49
10	5,904	5,040.45	479.79	33,131.17	3,639.57	2,556.25
11	6,338	5,374.14	551.88	38,505.31	4,191.46	2,968.22
12	7,440	6,212.54	743.86	44,717.84	4,935.32	3,451.82
13	7,987	6,746.49	721.36	51,464.34	5,656.68	3,970.98
14	8,566	7,178.94	830.26	58,643.28	6,486.94	4,527.76
15	8,909	7,435.13	894.78	66,078.42	7,381.72	5,106.85
16	9,546	7,910.91	1,014.60	73,989.32	8,396.33	5,727.34
17	10,220	8,414.32	1,141.38	82,403.64	9,537.71	6,391.64
18	10,629	8,719.80	1,218.32	91,123.44	10,756.02	7,082.52
19	11,723	9,536.91	1,424.10	100,660.35	12,180.12	7,844.52
20	12,573	10,161.36	1,594.40	110,821.70	13,774.52	8,661.76
21	13,076	10,522.11	1,703.95	121,343.81	15,478.47	9,511.70
22	14,011	11,192.69	1,907.60	132,536.50	17,386.07	10,422.42
23	14,572	11,595.04	2,029.78	144,131.54	19,415.85	11,369.60
24	15,600	12,332.32	2,253.68	156,463.86	21,669.53	12,383.60
25	16,224	12,779.85	2,389.59	169.243.71	24,059.12	13,438.16
26	17,355	13,570.56	2,656.36	182,814.27	26,715.48	14,566.24
27	18,050	14,048.38	2,828.38	196,862.65	29,543.86	15,739.49
28	18,772	14,544.75	3,007.07	211,407.40	32,550.93	16,959.67

TABLE VI. - Continued. LIFETIME EARNINGS FOR 10% MAN

(a) Continued. Past - salary base decreases 4% each earlier year

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
29	20,065	15,268.69	3,492.09	226,676.09	36,043.01	18,263.89
30	20,865	15,806.20	3,702.58	242,482.28	39.745.59	19,620.12
31	21,702	16,356.78	3,934.59	258,839.06	43,680.19	21.030.75
32	23,183	17,146.18	4,529.93	275,985.24	48,210.11	22,537.64
33	24,110	17,755.96	4,786.89	293,741.20	52,997.01	24,104.79
34	25,074	18,356.35	5,087.84	312,097.54	58,084.85	25,734.60
35	26.761	19,188.05	5,833.48	331,285.59	63,918.33	27,474.07
36	27,832	19,850.14	6,172.78	351,135.73	70,091.11	29,283.15
37	28,945	20,500.78	6,562.80	371,636.51	76,653.91	31,164.57
38	30,103	21,107.80	6,975.51	392,807.31	83,629.42	33,121.27
39	31,307	21,867.43	7,404.61	414,674.74	91.034.03	35,156.22
40	32,559	22,588.44	7,854.23	437,263.17	98,888.26	37,272.56
41	22,613.6	22,613.6	--------	459,876.77	98,888	
42	↓	21,522	1,092	466,740	99,980	
43		18,057	4,557	484,797	104,537	
44		18,426	4,187.3	503,223	108,724	
45		↓	↓	521,649	112,911	
46				540,075	117,099	
47				558,501	121,286	
48				576,927	125,473	
49				595,353	129,660	
50				613,779	133,848	
51				632,205	138,035	
52				650,631	142,222	
53				669,057	146,410	
54	↓	↓	↓	687,483	150,597	

TABLE VI. - Continued. LIFETIME EARNINGS FOR 10% MAN

(a) Concluded. Past - salary base decreases 4% each earlier year

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
55	22,613.6	18,426	4,187.3	705,909	154,784	
56	↓	↓	↓	724,335	158,971	
57				742,261	163,159	
58				761,187	167,346	
59				779,613	171,533	
60				798,039	175,721	

(b) Present - salary base fixed

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
1	9,934	7,390.39	1,897.90	7,390.39	1,897.90	645.71
2	11,186	8,213.95	2,244.96	15,604.34	4,142.86	1,372.80
3	12,729	9,191.27	2,710.35	24,795.60	6,853.21	2,200.19
4	13,691	10,527.59	2,273.50	35,323.19	9,126.71	3,090.10
5	14,506	11,112.10	2,451.01	46,435.29	11,577.72	4,032.99
6	15,268	11,640.75	2,634.83	58,076.04	14,212.55	5,024.41
7	16,075	12,360.56	2,669.56	70,436.60	16,882.11	6,070.29
8	16,604	12,724.25	2,800.49	83,160.85	19,682.60	7,149.55
9	18,531	14,049.06	3,277.42	97,209.92	22,960.02	8,354.06
10	19,149	14,638.94	3,265.38	111,848.85	26,225.40	9,598.75
11	19,767	15,063.81	3,418.33	126,912.67	29,643.73	10,883.60
12	22,309	16,756.06	4,102.85	143,668.73	33,746.58	12,333.69
13	23,029	17,414.48	4,117.64	161,083.21	37,864.22	13,830.57
14	23,749	17,888.09	4,317.22	178,971.30	42,181.45	15,374.26
15	23,749	17,888.09	4,317.22	196,859.39	46,498.67	16,917.94
16	24,469	18,361.71	4,516.81	215,221.10	51,015.48	18,508.43

TABLE VI. - Continued. LIFETIME EARNINGS FOR 10% MAN

(b) Continued. Present - salary base fixed

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
17	25,189	18,835.32	4,716.39	234,056.42	55,731.87	20,145.71
18	25,189	18,835.32	4,716.39	252,891.75	60,448.26	21,783.00
19	26,714	19,792.59	5,185.00	272,684.34	65,633.25	23,519.41
20	27,549	20,308.79	5,449.52	292,993.13	71,082.78	25,310.09
21	27,549	20,308.79	5,449.52	313,301.93	76,532.30	27,100.78
22	28,384	20,824.99	5,714.05	334,126.91	82,246.35	28,945.74
23	28,384	20.824.99	5,714.05	354,951.90	87,960.40	30,790.70
24	29,219	21,341.19	5,978.58	376,293.09	93,938.98	32,689.93
25	29,219	21,341.19	5,978.58	397,634.28	99,917.56	34,589.17
26	30,054	21,855.24	6,245.25	419,489.52	106,162.81	36,542.68
27	30,054	21,855.24	6,245.25	441,344.76	112,408.05	38,496.19
28	30,054	21,855.24	6,245.25	463,200.01	118,653.30	40,449.70
29	30,889	22,100.78	6,780.44	485,300.78	125,433.74	42,457.48
30	30,889	22,100.78	6,780.44	507,401.56	132,214.18	44,465.27
31	30,889	22,100.78	6,780.44	529,502.33	138,994.62	46,473.05
32	31,724	22,346.31	7,315.63	551,848.64	146,310.25	48,535.11
33	31,724	22,346.31	7,315.63	574,194.95	153,625.88	50,597.17
34	31,724	22,346.31	7,315.63	596,541.25	160,941.52	52,659.23
35	32,559	22,588.44	7,854.23	619,129.69	168,795.75	54,775.57
36	32,559	22,588.44	7,854.23	641,718.12	176,649.98	56,891.90
37	32,559	22,588.44	7,854.23	664,306.56	184,504.21	59,008.24
38	32,559	22,588.44	7,854.23	686,894.99	192,358.44	61,124.57
39	32,559	22,588.44	7,854.23	709,483.43	200,212.67	63,240.91
40	32,559	22,588.44	7,854.23	732,071.86	208,066.90	65,357.24
41	22,613.61	22,613.61	--------	754,685	208,067	
42	22,613.61	22,613.61	--------	777,299	208,067	
43	22,613.61	22,454	159.8	799,753	208,227	

TABLE VI. - Continued. LIFETIME EARNINGS FOR 10% MAN

(b) Concluded. Present - salary base fixed

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
44	22,613.61	18,426	4,187.3	818,179	212,414	
45	↓	↓	↓	836,605	216,601	
46				855,031	220,789	
47				873,457	224,976	
48				891,883	229,163	
49				910,309	233,350	
50				928,735	237,538	
51				947,161	241,725	
52				965,587	245,912	
53				984,013	250,100	
54				1,002,439	254,287	
55				1,020,865	258,474	
56				1,039,291	262,661	
57				1,057,717	266,849	
58				1,076,143	271,036	
59				1,094,569	275,223	
60	↓	↓	↓	1,112,995	279,411	

(c) Future - salary base increases 4% each future year

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
1	9.934	7,390	1,898	7,390	1,898	646
2	11,633	8,508	2,369	15,898	4,267	1,402
3	13,768	9,834	3,040	25,732	7,306	2,297
4	15,401	11,732	2,668	37,464	9,974	3,298
5	16,970	12,811	3,056	50,275	13,030	4,401
6	18,576	13,915	3,454	64,190	16,484	5,608

TABLE VI. - Continued. LIFETIME EARNINGS FOR 10% MAN

(c) Continued. Future - salary base increases 4% each future year

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
7	20,304	15,252.37	3,731.87	79,442.38	20,215.53	6,928.09
8	21,850	16,269.33	4,160.42	95,711.71	24,375.95	8,348.34
9	25,361	18,533.77	5,178.76	114,245.48	29,554.71	9,996.81
10	27,255	19,915.84	5,567.58	134,161.33	35,122.29	11,768.38
11	29,260	21,155.33	6,202.77	155,316.66	41,325.06	13,670.28
12	34,344	24,083.02	8,028.62	179,399.68	49,353.68	15,902.64
13	36,870	25,726.94	8,746.51	205,126.62	58,100.19	18,299.19
14	39,544	27,175.24	9,798.40	232,301.87	67,898.58	20,869.55
15	41,126	27,996.62	10,456.19	260,298.49	78,354.77	23,542.74
16	44,067	29,501.80	11,700.85	289,800.28	90,055.62	26,407.10
17	47,179	31,025.12	13,087.24	320,825.40	103,142.87	29,473.73
18	49,066	31,910.55	13,966.16	352,735.95	117,109.03	32,663.02
19	54,118	34,195.92	16,404.41	386,931.87	133,513.44	36,180.69
20	58,042	35,922.48	18,346.79	422,854.35	151,860.23	39,953.42
21	60,363	36,943.72	19,495.69	459,798.07	171,355.92	43,877.02
22	64,681	38,737.61	21,739.12	498,535.68	193,095.04	48,081.28
23	67,268	39,799.06	23,096.52	538,334.74	216,191.56	52,453.70
24	72,017	41,747.58	25,588.32	580,082.32	241,779.88	57,134.81
25	74,897	42,920.28	27,108.42	623,002.60	268,888.29	62,003.11
26	80,119	44,959.47	29,951.80	667,962.07	298,840.09	67,210.85
27	83,324	46,211.02	31,696.92	714,173.09	330,537.01	72,626.91
28	86,657	47,512.56	33,511.74	761,685.65	364,048.74	78,259.61
29	92,627	49,317.02	37,289.22	811,002.67	401,337.97	84,280.37
30	96,332	50,653.79	39,416.63	861,656.46	440,754.60	90,541.95
31	100,185	52,043.95	41,629.03	913,700.40	482,383.63	97,053.97
32	107,009	53,980.07	46,073.35	967,680.47	528,456.97	104,009.56
33	111,290	55,439.89	48,616.26	1,023,120.36	577,073.23	111,243.41
34	115,741	56,905.61	51,312.23	1,080,025.97	628,385.46	118,766.57

TABLE VI. - Concluded. LIFETIME EARNINGS FOR 10% MAN

(c) Concluded. Future - salary base increases 4% each future year

Yrs	Gross salary, S	Net salary	Tax	$\sum$ net salary	$\sum$ tax	$\sum$ 0.065S
35	123,539	59,001.13	56,507.84	1,139,027.10	684,893.30	126,796.61
36	128,481	60,588.50	59,541.24	1,199,615.60	744,434.53	135,147.87
37	133,620	62,239.14	62,695.56	1,261,854.74	807,130.09	143,833.17
38	138,965	63,870.85	66,061.42	1,325,725.59	873,191.51	152,865.90
39	144,523	65,546.03	69,582.97	1,391,271.62	942,774.49	162,259.89
40	150,304	67,288.43	73,245.81	1,458,560.05	1,016,020.30	172,029.65
41	99,500	99,500	---------	1,558,060	1,016,020	
42		93,600	5,900	1,651,660	1,021,920	
43		57,491	42,009	1,709,151	1,063,929	
44		58,264	41,236	1,767,416	1,105,164	
45				1,825,680	1,146,400	
46				1,883,944	1,187,638	
47				1,942,208	1,228,871	
48				2,000,472	1,270,107	
49				2,058,436	1,311,343	
50				2,117,000	1,352,579	
51				2,175,264	1,393,814	
52				2,233,528	1,435,050	
53				2,291,792	1,476,286	
54				2,350,056	1,517,521	
55				2,408,320	1,558,757	
56				2,466,584	1,599,993	
57				2,524,848	1,641,228	
58				2,583,112	1,682,464	
59				2,641,376	1,723,700	
60				2,699,640	1,764,936	

TABLE VII. - ACCUMULATED NET INCOME AND TAX - 10 PERCENTILE R & D

Years	Past		Present		Future	
	Income	Tax	Income	Tax	Income	Tax
10	33,131	3,640	111,849	26,225	134,161	35,122
20	110,822	13,775	292,993	71,083	422,854	151,860
30	242,482	39,756	507,402	132,214	861,656	440,755
40	437,263	98,888	732,071	208,067	1,458,560	1,016,020
[a]50	613,799	133,848	928,735	237,528	2,117,000	1,352,579
[a]60	798,039	175,721	1,112,995	279,411	2,699,640	1,764,936

[a]Retirement.

TABLE VIII. - ACCUMULATED SALARY AND TAX - 10 PERCENTILE R & D

Years	Gross	Net	Tax	% Gross
10	181,052	134,161	35,122	19
20	614,669	422,854	151,860	25
30	1,392,954	861,656	440,755	32
40	2,646,600	1,458,560	1,016,020	38
[a]50	3,641,600	2,117,000	1,352,579	37
[a]60	4,636,600	2,699,640	1,764,936	38

[a]Retirement.

TABLE IX. - RETIREMENT TAKE-HOME PAY, PERCENTAGE OF WORKING TAKE-HOME PAY

Condition	"PAST"		"PRESENT"		"FUTURE"	
Years	%	Return ratio	%	Return ratio	%	Return ratio
40	0	0	0	0	0	0
50	40.4	4.74	26.9	3.01	45.1	3.83
60	82.5	9.68	52.0	5.82	85.1	7.21

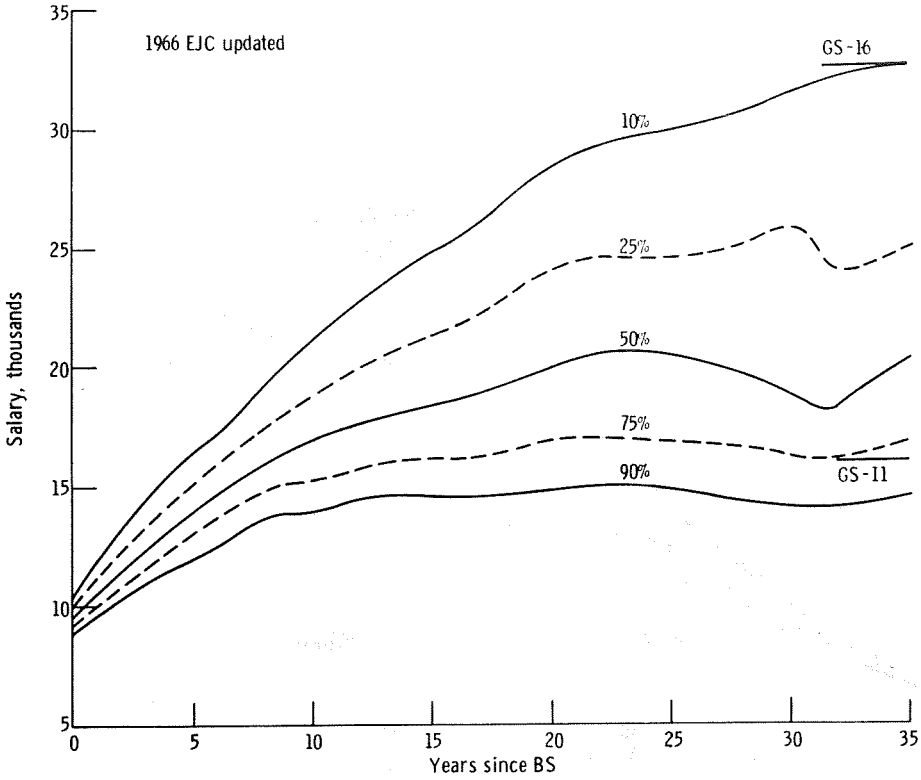

Figure 1. - Assumed SVE curves for engineers and scientists.

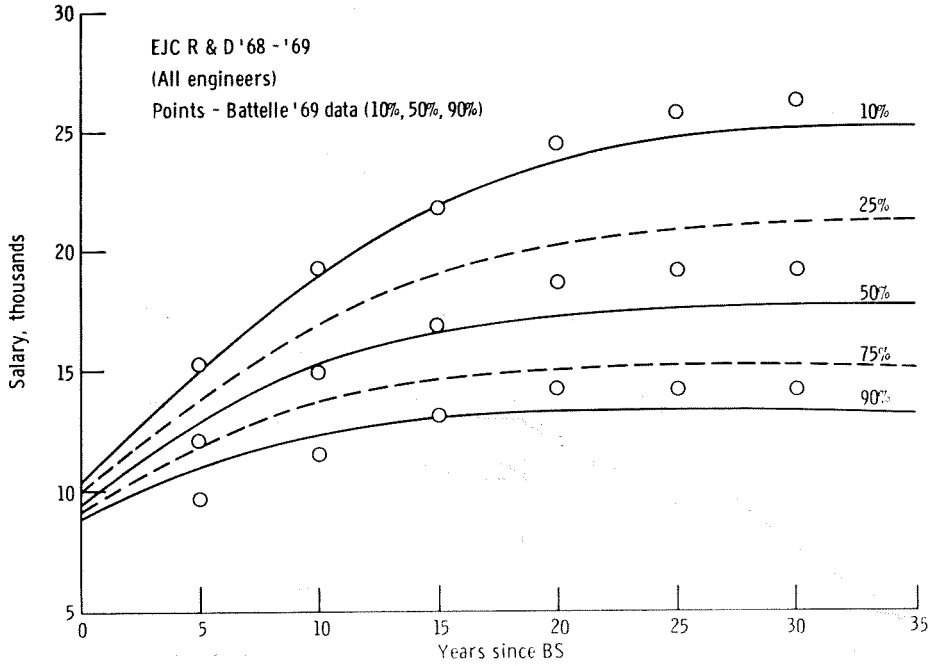

Figure 2. - SVE curves from refs. 2 and 3.

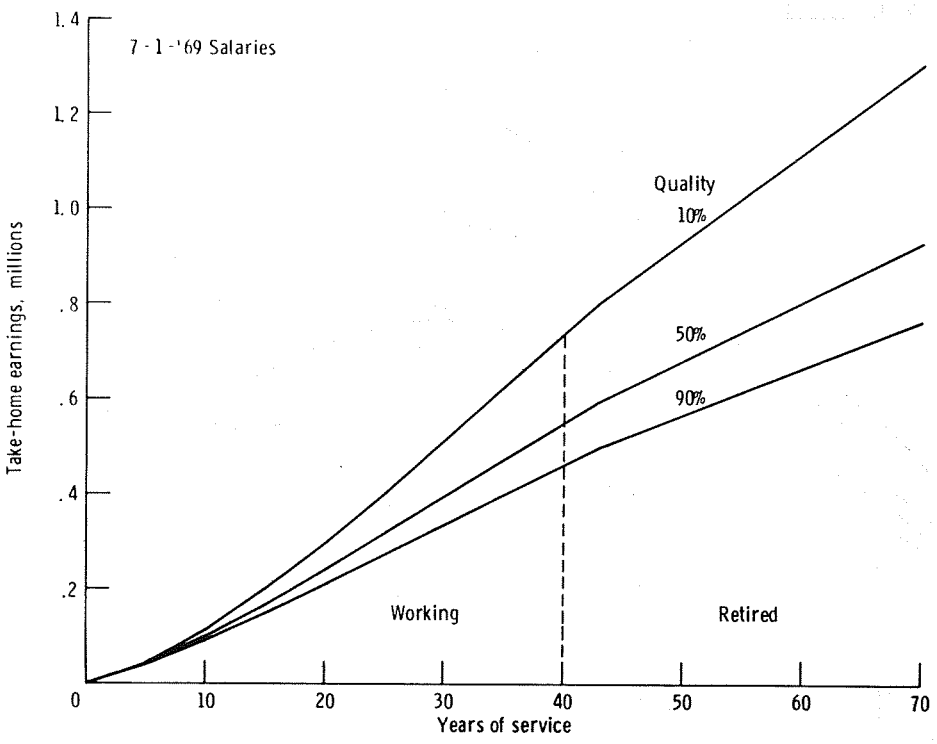

Figure 3. - Lifetime earnings (fixed salary base).

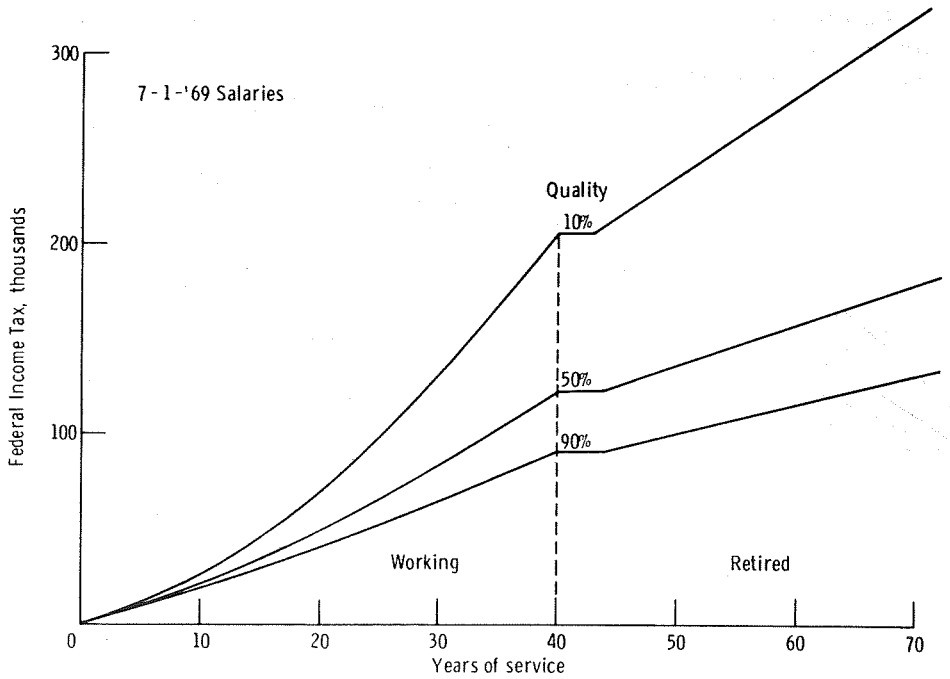

Figure 4. - Lifetime Federal Income Tax (fixed salary base).

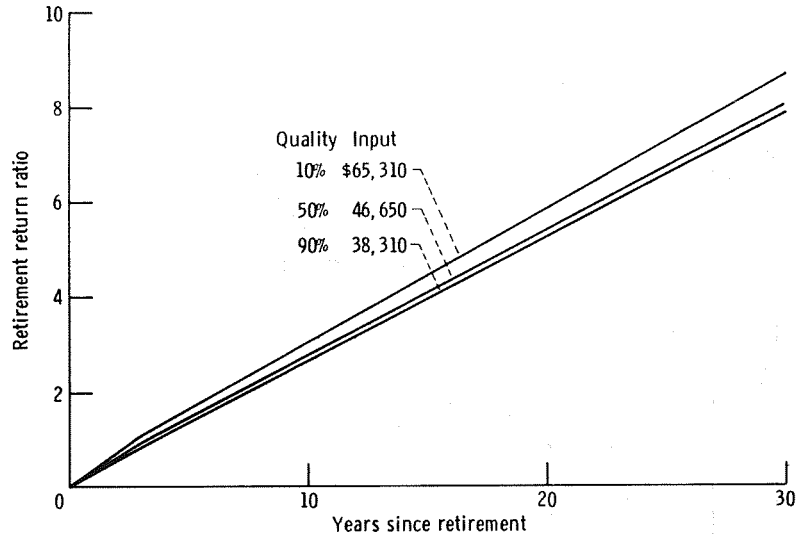

Figure 5. - Retirement return ratio (fixed salary base).

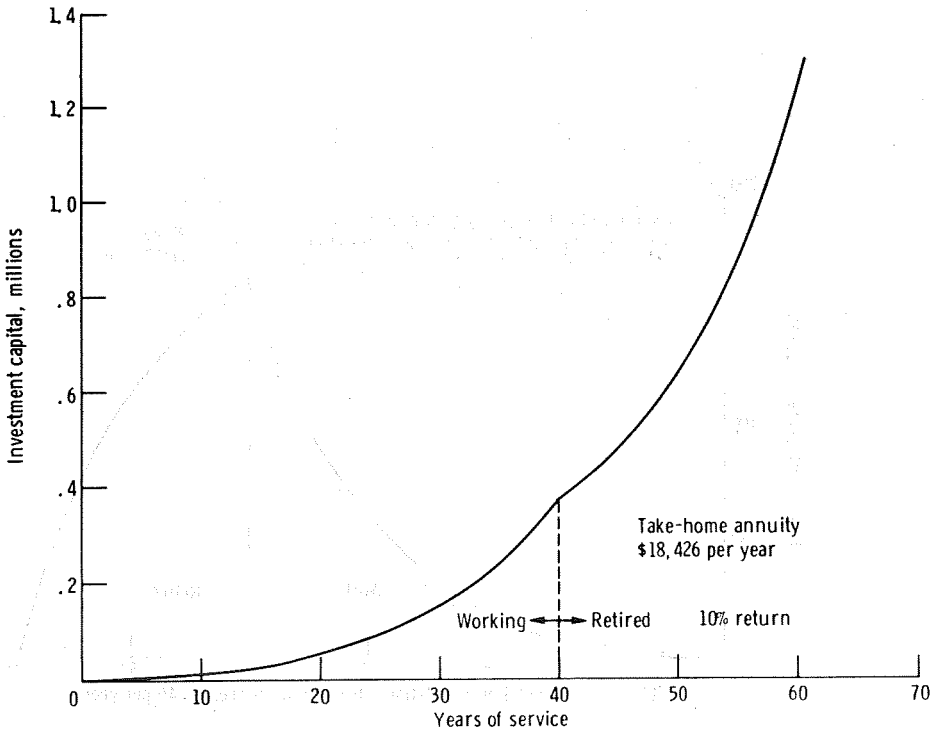

Figure 6. - Capital accumulation. Investment $6\frac{1}{2}$% of salary.

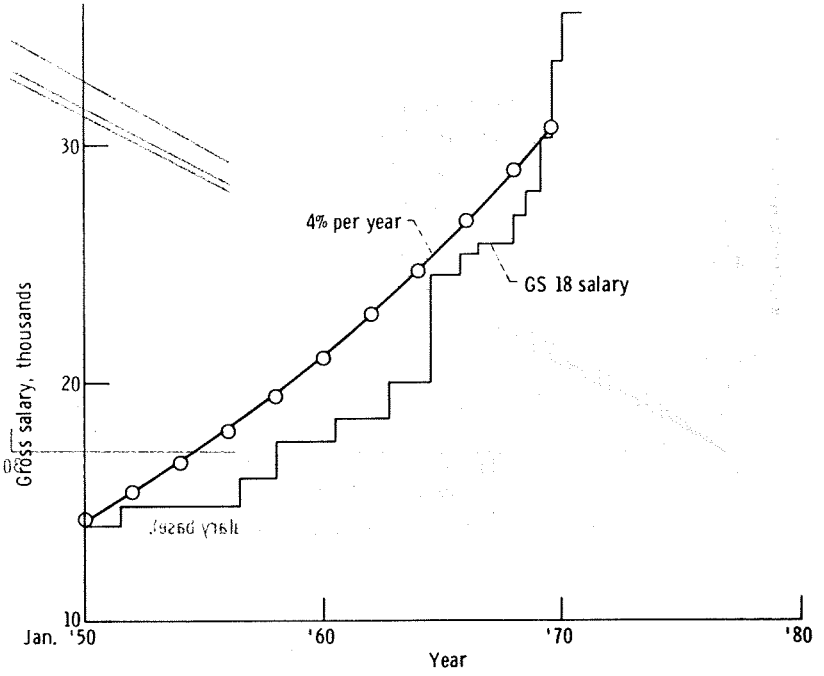

Figure 7. - Change of salary base with time.

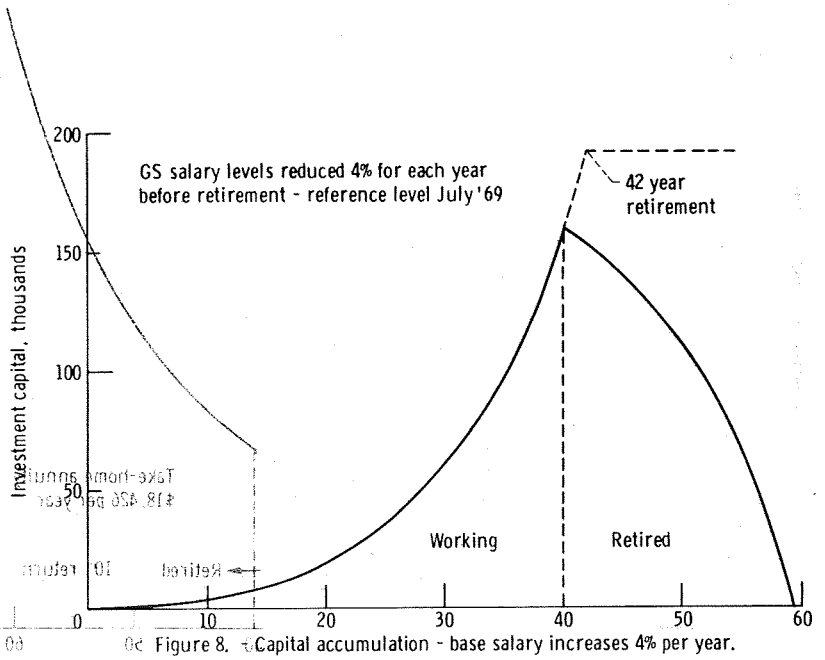

Figure 8. - Capital accumulation - base salary increases 4% per year.

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